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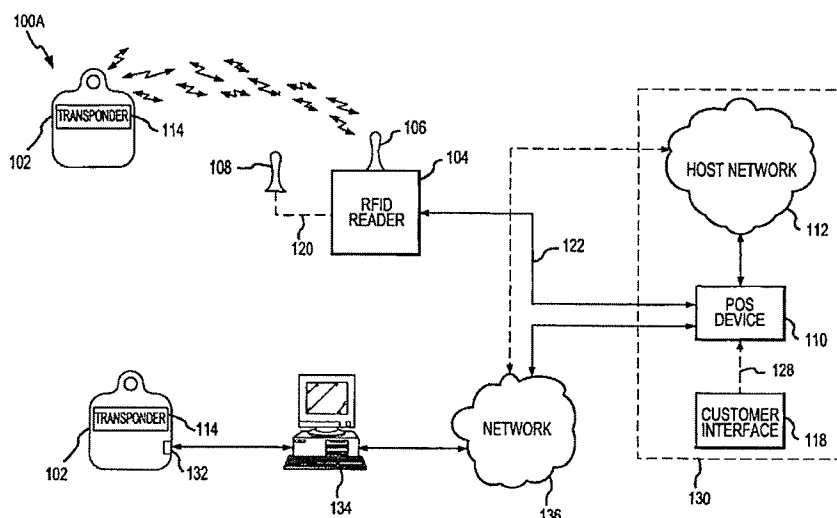
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[Continued on next page]

(54) Title: SYSTEM AND METHOD FOR PAYMENT USING RADIO FREQUENCY IDENTIFICATION IN CONTACT AND CONTACTLESS TRANSACTIONS



(57) Abstract: A transporter-reader payment system includes a fob (102) including a transponder (114), and a RFID reader (104) for interrogating the transponder (102). The system may further include a personalization system (134) for populating onto the fob (102) and RFID reader (104) identifying information and security and authentication keys which may be used during mutual authentication of the fob (102) and the reader (104) and for completing a transaction. In exemplary operation, the fob (102) and RFID reader (104) may be personalized, the fob (102) may be presented to the RFID reader (104) for interrogation, the fob (102) and reader (104) may engage in mutual authentication, and fob (102) identifying information may be provided to the reader (104) for transaction completion. In another exemplary embodiment, operation of the transponder-reader payment system may be controlled by an activation circuit. Further, the fob (102) may be responsive to multiple interrogation signals.



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YU, ZA, ZM, ZW.

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Date of publication of the amended claims: 31 July 2003

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

Published:

- with international search report
- with amended claims

**[Received by the International Bureau on February 28, 2003 (28.02.03):
original claims 1-62 replaced by amended claims 1-59 (pages 29-40)]**

1. A transponder-reader payment system comprising:
 - a. a Radio Frequency Identification (RFID) reader operable to provide a radio frequency (RF) interrogation signal for powering a transponder system, receiving a transponder system RF signal, and communicating a transponder system account data related to said transponder system RF signal to a merchant system, said RFID reader including,
 - i. a first interrogator for providing a first RF interrogation signal;
 - ii. a RFID authentication circuit in communication with said interrogator;
 - iii. a RFID database, in communication with said RFID authentication circuit, said database operable to store at least one of a RFID reader identifying data, a transponder system decryption security key, a RFID reader and encryption security key and a transponder authentication key;
 - iv. at least one of a serial interface and a universal serial bus (USB) interface; and
 - v. a RFID protocol/sequence controller in communication with at least one of said first interrogator, said RFID authentication circuit, said RFID database, and said USB interface, said RFID protocol/sequence controller configured to facilitate control of the order of operation of said interrogator, said RFID authentication circuit, said RFID database, and said USB interface.
2. A system according to claim 1 further comprising:
 - a. a transponder system operable to receive said first RF interrogation signal, authenticate said first RF interrogation signal, and transmit said transponder system account data, said transponder system comprising:
 - i. a first transponder responsive to said RF interrogation signal;

- ii. a first transponder system antenna configured to receive said first RF interrogation signal;
- iii. a second transponder responsive to a second RF interrogation signal, said first RF interrogation signal different from said second RF interrogation signal;
- iv. a second transponder system antenna configured to receive said second RF interrogation signal;
- v. a transponder system authentication circuit in communication with at least one of said first transponder and said second transponder; and
- vi. a transponder system database in communication with said transponder system authentication circuit.

3. A system according to claim 2, wherein said transponder system further includes:

- a. a transponder system USB interface; and
- b. a transponder system protocol/sequence controller in communication with at least one of said first transponder, said second transponder, said transponder system USB interface, said transponder system authentication circuit, and said transponder system database, said transponder system protocol/sequence controller configured to control the order of operation of said first transponder, said second transponder, said transponder system authentication circuit, said transponder system database, and said transponder system USB interface.

4. A system according to claim 1, wherein said RFID reader further includes:

- a. a second interrogator, said second interrogator operable to send a second RF interrogation signal; and
- b. a RFID communications interface configured to communicate with a merchant system, said communications interface operable to provide said transponder system account data.

5. A system according to claim 4, wherein said RFID reader further includes a first antenna in communication with said first interrogator and a second antenna in communication with said second interrogator, wherein said first antenna is operable to provide said first RF interrogation signal to said first transponder and said second interrogator is operable to provide said second RF interrogation signal to said second transponder.
6. A system according to claim 1, wherein said RFID database is operable to store a transponder system personal identification number (PIN).
7. A system according to claim 5, wherein said RFID reader further comprises at least one of a RFID internal antenna, and a RFID external antenna, said RFID internal antenna and said RFID external antenna configured to provide at least one of said first RF interrogation signal and said second RF interrogation signal.
8. A system according to claim 3, wherein said transponder system protocol/sequence controller is responsive to at least one of said first RF interrogation signal and said second RF interrogation signal, said transponder protocol/sequence controller controlling the sequence of operation at least one of said transponder system authentication circuit, said transponder system database, and said transponder system USB interface in response to at least one of said first RF interrogation signal and said second RF interrogation signal.
9. A system according to claim 3, wherein said transponder system protocol/sequence controller is configured to activate said transponder system authentication circuit in response to said first RF interrogation signal, said transponder system authenticating circuit configured to provide an encrypted RF interrogation signal, said transponder system authentication circuit configured to provide said encrypted RF interrogation signal to said first transponder for providing to said RFID reader.
10. A system according to claim 9, wherein said RFID reader is configured to receive said encrypted RF interrogation signal, said transponder system protocol/sequence controller

activating said transponder system authentication circuit in response to said encrypted RF interrogation signal.

11. A system according to claim 10, wherein said RFID database is configured to provide a transponder system decryption key to said RFID authentication circuit in response to said encrypted RF interrogation signal, said transponder system decryption key for use in decrypting said encrypted RF interrogation signal, providing a decrypted RF interrogation signal, said transponder system decryption key provided to said RFID reader based on an unique transponder identification code.

12. A system according to claim 11, wherein said RFID authentication circuit is configured to compare said decrypted RF interrogation signal and said RF interrogation signal to determine whether a match exists.

13. A system according to claim 12, wherein said RFID protocol/sequence controller is configured to activate at least one of said USB interface and said RFID communication interface where said RFID authentication circuit matches said decrypted RF interrogation signal and said RF interrogation signal.

14. A system according to claim 13, wherein said transponder system protocol/sequence controller activates said transponder system authentication circuit in response to at least one of said first RF interrogation signal and said second RF interrogation signal.

15. A claim according to claim 14, wherein said transponder system authentication circuit is configured to provide a transponder authentication code to at least one of said first transponder and said second transponder for providing to said RFID reader.

16. A system according to claim 15, wherein said RFID reader is configured to receive said transponder authentication code, said RFID protocol/sequence controller activating said RFID authentication circuit in response to said transponder authentication code, said RFID authentication circuit configure to encrypt said transponder authentication code.

17. A system according to claim 16, wherein said RFID reader is configured to provide said encrypted authentication code to said transponder system.
18. A system according to claim 17, wherein said transponder system database is operable to store at least one of a transponder system identification data, a RFID reader decryption security key, and a transponder system account data.
19. A system according to claim 18, wherein said transponder system database is configured to provide said RFID reader decryption security key to said transponder system authentication circuit in response to said encrypted authentication code, said RFID reader decryption key for use in decrypting said encrypted transponder authentication code and providing a decrypted transponder authentication code.
20. A system according to claim 19, wherein said transponder system authentication circuit is configured to compare said decrypted transponder authentication code and said transponder authentication code to determine if a match exists.
21. A system according to claim 20, wherein said account data is in magnetic stripe format.
22. A system according to claim 21, wherein said transponder system transaction account data is pre-encrypted.
23. A system according to claim 22, wherein said transponder system database is configured to provide said pre-encrypted transponder system account data to said RFID reader where said transponder system authentication circuit matches said decrypted transponder authentication code and said transponder authentication code.
24. A system according to claim 23, wherein said RFID communications interface is configured to provide said transponder system PIN and said pre-encrypted transponder system account data where said transponder authentication code matches said decrypted

transponder authentication code, and said decrypted RF interrogation signal matches said RF interrogation signal.

25. A system according to claim 24, wherein said transponder system further comprises a switch, said switch operable to enable or disable operation of said transponder system.

26. A system according to claim 25, wherein said switch is configured to place the transponder system in at least one of a selectivity mode and an inclusivity mode.

27. A system according to claim 25, wherein said switch is mechanical.

28. A system according to claim 25, wherein said switch is configured to respond to a logic circuit.

29. A system according to claim 2, wherein said transponder system further includes an internal power source.

30. A system according to claim 29, wherein said switch is in communication with said internal power source, said switch responsive to said internal power source.

31. A system according to claim 29, wherein said transponder system further includes a biometric circuit, said biometric circuit in communication with said internal power source.

32. A system according to claim 25, wherein said switch is a biometric circuit, said biometric circuit operable to enable or disable operation of said transponder system.

33. A system according to claim 32, wherein said biometric circuit is configured to place said transponder system in one of a selectivity mode and an inclusivity mode.

34. A system according to claim 7, wherein said RFID reader includes a RFID PIN keypad, said RFID PIN keypad configured to receive said transponder PIN, said RFID reader configured to compare said transponder PIN to said received transponder PIN, said RFID reader operable to provide at least one of said received transponder PIN, said transponder PIN, or a verification of said received transponder PIN, verification of received transponder

PIN provided where said RFID reader matches said transponder PIN to said received transponder PIN.

35. A system according to claim 7, wherein said RFID reader is configured to provide said transponder PIN to a payment authorization center for verification of said transponder PIN.

36. A system according to claim 34, wherein said merchant system includes a merchant system PIN keypad, said merchant system PIN keypad configured to receive said transponder PIN from said merchant system PIN keypad, said merchant system configured to provide said transponder PIN to said payment authorization center for verification.

37. A system according to claim 31, wherein said biometric circuit is configured to provide a biometric data verification response, said biometric circuit configured to provide said biometric data verification response to at least one of said RFID reader and said merchant system, wherein said biometric data verification response is an identification verification data.

38. A system according to claim 3, further comprising a personalization system operable to initialize at least one of said transponder system and said RFID reader to transponder-reader payment system parameters.

39. A system according to claim 38, wherein said personalization system is in communication with said transponder system using at least one of a USB connector and RF communications.

40. A system according to claim 39, wherein said personalization system is in electrical communications with said RFID reader.

41. A system according to claim 40, wherein said personalization system is operable to populate at least one of said RFID reader identifying data, transponder system decryption security key, RFID encryption security key, and transponder PIN on said RFID database.

42. A system according to claim 41, wherein said personalization system is operable to populate at least one of said transponder system identification data, a RFID reader decryption security key, a transponder encryption authentication security key, a transponder system transactional account data, and a transponder system authentication security key onto said transponder system database.

43. A system according to claim 2, wherein said RFID reader is operable to initialize said transponder.

44. A system according to claim 2, wherein said RFID reader is in RF communication with said transponder system, said RFID reader operable to populate at least one of said transponder system identification data, a RFID reader decryption security key, a transponder system transactional account data onto said transponder system database.

45. A transponder-reader payment system including a transponder system operable to receive a first RF interrogation signal, and authenticate said first RF interrogation signal, said transponder system comprising:

- a. a first transponder responsive to said first RF interrogation signal;
- b. a second transponder responsive to a second RF interrogation signal, said first RF interrogation signal different from said second RF interrogation signal;
- c. a first transponder system antenna configured to receive said first RF interrogation signal; and
- d. a second transponder system antenna configured to receive said second RF interrogation signal.

46. A system according to claim 45, wherein said transponder system further includes at least one of a transponder system USB interface, transponder system authentication circuit, and a transponder system serial interface.

47. A transponder-reader payment system comprising:

a. a RFID reader operable to provide a RF interrogation signal for powering a transponder system, receiving a transponder system RF signal, and communicating a transponder system account data related to said transponder system RF signal to a merchant system, said RFID reader including:

i. a first RFID reader antenna in communication with a first interrogator for providing a first RF interrogation signal; and

ii. a second RFID reader antenna in communication with a second interrogator, for providing a second RF interrogation signal;

b. a transponder system operable to receive at least one of said first and second RF interrogation signal, authenticate said received interrogation signal, and transmit a transponder system account data, said transponder system comprising:

i. a first transponder antenna in communication with a first transponder, said first transponder responsive to said first RF interrogation signal; and

ii. a second transponder antenna in communication with a second transponder, said second transponder responsive to said second RF interrogation signal.

48. A system according to claim 47, wherein said RFID reader includes at least one of a a RFID reader authentication circuit, a RFID reader serial interface and a RFID reader USB interface, and said transponder system includes at least one of a transponder system USB interface, transponder system authentication circuit, and a transponder system serial interface.

49. A method of transponder-reader payment comprising the steps of:

a. providing a transponder system, the transponder system responsive to a plurality of interrogation signals, the transponder system storing at least one of an account data, an account name, and account expiration date, the transponder system including at least a first transponder responsive to a first interrogation signal and a second transponder responsive to a second interrogation signal; and

b. providing a RFID reader, said reader configured to provide at least one of the interrogation signals.

50. A method according to claim 49, further comprising the steps of:

- a. encrypting the transponder system account data;
- b. initializing the transponder system;
- c. initializing the RFID reader;
- d. mutually authenticating the RFID reader and the transponder system;
- e. providing the encrypted account data from the transponder system to the RFID reader;
- f. decrypting the encrypted account data; and
- g. providing the decrypted account data to a merchant system.

51. A method according to claim 50, wherein mutual authenticating includes the RFID reader authenticating the transponder system, and the transponder system authenticating the RFID reader.

52. A method according to claim 51, wherein mutual authentication includes:

- a. providing an interrogation signal from the RFID reader to the transponder system;
- b. encrypting the interrogation signal at the transponder system to form an encrypted authentication interrogation signal;
- c. providing the encrypted authentication interrogation signal to the RFID reader;
- d. decrypting the encrypted authentication interrogation signal at the RFID reader, decrypting including using a transponder system decryption security key;
- e. matching the interrogation signal to the decrypted interrogation signal;

- f. providing an authorization code from the transponder system to the RFID reader;
- g. encrypting the authorization code at the RFID reader to form an encrypted authorization code;
- h. providing the encrypted authorization code to the transponder system;
- i. decrypting the encrypted authorization code at the transponder system, decrypting including using a RFID reader decryption security key; and
- j. matching the authorization code to the decrypted authorization code.

53. A method according to 52, where initializing the transponder system includes populating at least one of a transponder system identification data, a RFID reader decryption security key, a transponder system transactional data, and an encrypted transponder PIN onto a transponder system database.

54. A method according to claim 53, wherein initializing the RFID reader includes populating at least one of a transponder system identification data, a RFID reader decryption security key, a transponder system transactional data, and an encrypted transponder PIN onto a transponder system database.

55. A method according to claim 49, wherein initializing the RFID reader includes populating at least one of a RFID reader identifying data, a transponder system decryption security key, a RFID encryption security key, and a transponder PIN onto a RFID database using a USB interface.

56. A method according to claim 53, wherein initializing the transponder system includes populating at least one of a transponder system identifying data, a RFID reader decryption security key, and a transponder system transaction data using a USB interface.

57. A method according to claim 49, wherein initializing the transponder system, includes initializing said transponder system using a RFID reader.

58. A method according to claim 54, including using a switch to enable the transponder system, the switch consisting of at least one of a mechanical switch, a logic switch, and a biometric switch.

59. A method according to claim 58, including providing a secondary identification in response to a request from a merchant system.

PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

To:
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SNELL & WILMER L.L.P.
ONE ARIZONA CENTER
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PHOENIX, AZ 58004-2202

PCT

NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL SEARCH REPORT OR THE DECLARATION

(PCT Rule 44.1)

Applicant's or agent's file reference 40655.7016	Date of Mailing (day/month/year) 30 DEC 2002
International application No. PCT/US02/21903	International filing date (day/month/year) 10 July 2002 (10.07.2002)
Applicant AMERICAN EXPRESS TRAVEL RELATED SERVICES CO., INC	

1. ☒ The applicant is hereby notified that the international search report has been established and is transmitted herewith.

Filing of amendments and statement under Article 19:

The applicant is entitled, if he so wishes, to amend the claims of the international application (see Rule 46):

When? The time limit for filing such amendments is normally two months from the date of transmittal of the international search report.

Where? Directly to the International Bureau of WIPO, 34, chemin des Colombettes
1211 Geneva 20, Switzerland, Facsimile No.: (41-22) 740.14.35

For more detailed instructions, see the notes on the accompanying sheet.

2. ☐ The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect is transmitted herewith.

3. ☐ With regard to the protest against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:

☐ the protest together with the decision thereon has been transmitted to the International Bureau together with the applicant's request to forward the texts of both the protest and the decision thereon to the designated Offices.

☐ no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. Reminders

Shortly after 18 months from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau as provided in Rules 90 bis.1 and 90 bis.3, respectively, before the completion of the technical preparations for international publication.

Within 19 months from the priority date, but only in respect of some designated Offices, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase until 30 months from the priority date (in some Offices even later); otherwise the applicant must, within 20 months from the priority date, perform the prescribed acts for entry into the national phase before those designated Offices.

In respect of other designated Offices, the time limit of 30 months (or later) will apply even if no demand is filed within 19 months.

See the Annex to Form PCT/IB/301 and, for details about the applicable time limits, Office by Office, see the *PCT Applicant's Guide*, Volume II, National Chapters and the WIPO Internet site.

Name and mailing address of the ISA/US Commissioner for Patents Box PCT Washington, D.C. 20231 Facsimile No. (703)305-3230 Form PCT/ISA/220 (April 2002)	Authorized officer Brian A Zimmerman Telephone No. 703-305-4700
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(See notes on accompanying sheet)

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PATENT COOPERATION TREATY

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INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 40655.7016	FOR FURTHER ACTION	see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.
International application No. PCT/US02/21903	International filing date (<i>day/month/year</i>) 10 July 2002 (10.07.2002)	(Earliest) Priority Date (<i>day/month/year</i>) 10 July 2001 (10.07.2001)
Applicant AMERICAN EXPRESS TRAVEL RELATED SERVICES CO. , INC		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 3 sheets.



It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the Report

a. With regard to the language, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.



the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

b. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international search was carried out on the basis of the sequence listing:



contained in the international application in written form.



filed together with the international application in computer readable form.



furnished subsequently to this Authority in written form.



furnished subsequently to this Authority in computer readable form.



the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.



the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

2. ☐ Certain claims were found unsearchable (See Box I).

3. ☐ Unity of invention is lacking (See Box II).

4. With regard to the title,



the text is approved as submitted by the applicant.



the text has been established by this Authority to read as follows:

5. With regard to the abstract,



the text is approved as submitted by the applicant.



the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the drawings to be published with the abstract is Figure No. 1A



as suggested by the applicant.



because the applicant failed to suggest a figure.



because this figure better characterizes the invention.



None of the figures

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US02/21903

Box III TEXT OF THE ABSTRACT (Continuation of Item 5 of the first sheet)

The technical features mentioned in the abstract do not include a reference sign between parentheses (PCT Rule 8.1(d)).

NEW ABSTRACT

A transponder-reader payment system includes a fob (102) including a transponder (114), and a RFID reader (104) for interrogating the transponder (102). The system may further include a personalization system (134) for populating onto the fob (102) and RFID reader (104) identifying information and security and authentication keys which may be used during mutual authentication of the fob (102) and the reader (104) and for completing a transaction. In exemplary operation, the fob (102) and RFID reader (102) may be personalized, the fob (102) may be presented to the RFID reader (104) for interrogation, the fob (102) and reader (104) may engage in mutual authentication, and fob (102) identifying information may be provided to the reader (104) for transaction completion. In another exemplary embodiment, operation of the transponder-reader payment system may be controlled by an activation circuit. Further, the fob (102) may be responsive to multiple interrogation signals.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US02/21903

A. CLASSIFICATION OF SUBJECT MATTER IPC(7) : H04Q 1/00; G05B 19/00 US CL : 705/17, 18; 340/5.52, 5.6, 5.82 According to International Patent Classification (IPC) or to both national classification and IPC																				
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) U.S. : 705/17, 18; 340/5.52, 5.6, 5.82 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)																				
C. DOCUMENTS CONSIDERED TO BE RELEVANT																				
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.																		
X --- Y	US 6,073,840 A (MARION) 13 June 2000, Abstract and description of figures 4a, 4b, 5 and 6	1, 6, 7, 36-38, 50, 52-62 ----- 2-5, 8-35, 39-49																		
X --- Y	US 5,519,381 A (MARSH) 21 May 1996, column 3 lines 55 to column 4 lines 55	50 ----- 2-5, 8-35, 39-49																		
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> See patent family annex.																				
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